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REMARKS

The present application has been reviewed in light of the Office Action dated September 25, 2003. Claims 1-33 are presented for examination, of which Claims 1 and 16 are in independent form. New Claims 32 and 33 have been added to provide Applicants with a more complete scope of protection. Claims 1, 5, 11, 12, 15-17, 21, 27, 30, and 31 have been amended to define Applicants' invention more clearly. Favorable reconsideration is requested.

The title of the invention has been amended to --POWER TRANSFORMERS AND POWER INDUCTORS FOR LOW-FREQUENCY APPLICATIONS USING ISOTROPIC MATERIAL WITH HIGH POWER-TO-WEIGHT RATIO-- to more accurately reflect the invention to which the claims are directed.

In section 5 of the Office Action, on page 2, it is indicated that the content of page 8 of the specification is a duplicate of the content of page 6, and a requirement is made for clarification. In response, it appears that, due to a clerical error during photocopying, a duplicate of page 6 was inadvertently inserted in place of page 8. Applicants submit that the Replacement Page 8 submitted herewith corrects this error and is identical to the text found in the priority document for the present application. Accordingly, Applicants submit that the Replacement Page 8 adds no new matter to the present application.

An Information Disclosure Statement and a corresponding PTO-1449 form were submitted on June 2, 2003, as evidenced by the receipt postcard bearing the stamp of the U.S. Patent and Trademark Office, a copy of which is attached. Applicants respectfully request the Examiner to return an initialed copy of the PTO-1449 form, indicating that the references

listed thereon have been considered and made of record in the present application.

Applicants gratefully acknowledge the indication that Claims 1-15 have been allowed. Independent Claim 1 has been amended, but retains the feature of a core with integral cooling fins. Therefore, Applicants submit that Claim 1 remains allowable over the prior art of record. Similarly, Claims 2-15 depend from Claim 1 and also are submitted to be allowable over the prior art of record.

Additionally, Applicants gratefully acknowledge the indication that Claims 16-31 include allowable subject matter and would be allowable if rewritten to "overcome the rejection(s) under 35 U.S.C. 112, second paragraph." Applicants note, however, that the Office Action does not present any claim rejections under 35 U.S.C. § 112, second paragraph. Therefore, Applicants have interpreted the status of Claims 16-31 to be allowable if rewritten to overcome the objections indicated in section 4 of the Office Action, on page 2, which are discussed below.

In section 1 of the Office Action, on page 2, it is indicated that the abstract of the disclosure is objected to for the reason that the phrase "from DC to 1000Hz" is not believed to be correct. Similarly, in section 4 of the Office Action, on page 2, it is indicated that Claims 16 and 31 are objected to for the reason that the phrase "DC to 1000Hz" is believed to be incorrect. Applicants respectfully submit that the phrase "DC to is1000 Hz" is proper for at least the following reasons.

It appears that the Examiner believes that inductors cannot have a direct current (DC) component. Applicants submit, however, that there are many inductor applications in

which the current in the inductor has a DC component. For example, in the inductors used in output filters of many kinds of rectifiers, there is a strong DC component in the inductor current. These filters generally are known as DC filters made with electrolytic capacitors and DC chokes (see, for example, the article by Jovanovic et al. enclosed with the Information Disclosure Statement submitted herewith). The relatively small alternating current (AC) ripple component is effectively filtered to provide a "smoothed" direct current (DC) at the outputs of the rectifiers. Common terminology for such inductors includes "DC-link inductor," and "smoothing DC-link inductor," and "smoothing inductor" (see, for example, the article by Lundquist enclosed with the Information Disclosure Statement submitted herewith).

Accordingly, Applicants submit that the phrase "DC to 1000Hz" is proper and respectfully request withdrawal of the objections to the abstract and Claims 16-31.

In section 2 of the Office Action, on page 2, it is indicated that on page 11, line 17, of the specification, the recitation "DC supply" should be changed to --AC supply-- "to be consistent with figure 12 of the drawing." In response, Applicants submit that no such change is necessary, because the brief description of Fig. 12 is correct as written.

More specifically, the brief description of Fig. 12, on page 11, reads as follows: "Fig. 12 is a block diagram showing an application of the transformer with one or several secondary windings and connected to a rectifier circuit and for use as a DC supply for electronic components." That is, Fig. 12 shows a block diagram of a DC power supply, which is fed with AC at its input, and which supplies DC at its output. Such a power supply is commonly known

as a DC supply, and may be used in, for example, an AC-to-DC electrical energy converter.¹

Applicants note that there are many transformer applications in which the current in one or several transformer windings may have a DC component. Examples of such transformers include polyphase and single-phase transformers used in DC supplies for AC-to-DC electrical energy conversion, whose output windings are in series with only one, single rectifier or only one, single thyristor (instead of a bridge rectifier formed of a rectifier circuit made of several rectifiers or thyristors whose input current may have no DC component). In the block diagram of Fig. 12, the rectifier can be effectively made of one, single rectifier or thyristor only. That is, in a case of transformers whose output windings are in series with only one, single rectifier or one, single thyristor, there may be a DC component in the output windings, even if there is no DC component in the input windings of such transformers.

Accordingly, Applicants respectfully submit that no change to the brief description of Fig. 12 is necessary.

As a general matter, transformers and inductors operate utilizing alternating magnetic flux components in their cores. Consequently, the current in transformer and inductor windings have an AC component. However, the total current in one or several windings may also have a DC component, which may be different from zero, superposed with the AC component.

Applicants note that, in applications in which a transformer operates with an

¹ The examples provided herein are for illustrative purposes. It should be understood that the present invention is not limited to any details discussed in connection with the illustrative examples.

AC component of magnetic flux superposed with a DC component of magnetic flux in its core (created by a DC current component in one or several windings), an essential steady-state condition of suitable operation of the transformer, without saturation, is to have no DC *voltage* component in any winding (not no DC *current* component).

New Claims 32 and 33 depend from Claims 1 and 16, respectively, and are submitted to be patentable over the prior art of record. Because each dependent claim also is deemed to define an additional aspect of the invention, individual consideration of the patentability of each new claim on its own merits is respectfully requested.


In view of the foregoing remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

No petition to extend the time for response to the Office Action is deemed necessary for the present Amendment. If, however, such a petition is required to make this Amendment timely filed, then this paper should be considered such a petition and the Commissioner is authorized to charge the requisite petition fee to Deposit Account 06-1205.

CONCLUSION

Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,


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cooling fins which are a part of the magnetic core, if the fins are adequately oriented in the direction of the circulation of the flux. The cooling fins are then magnetically active and a further reduction of the total amount of material is obtained. This advantage is important for the realization of single phase transformers up to 10kVA.

The absence of audible noise is also an important advantage of cores used in AC applications which are realized with a soft magnetic composite material. The elimination of external stray magnetic fields is still further important advantage of the cores used in AC systems which present a cylindrical symmetry.

SUMMARY OF THE INVENTION

According to a broad aspect of the present invention there is provided a transformer for low frequency applications from 50 Hz to 1000 Hz. The transformer comprises a core having a cylindrical symmetry around a main revolution axis. The core is formed of a soft isotropic magnetic composite material composed of iron and resin. Windings are enclosed in the magnetic core and disposed about a central column of the magnetic core and magnetically coupled with the magnetic core. The core is formed by core sections.

According to a still further broad aspect of the present invention there is provided an inductor for low frequency applications, DC to 1000 Hz. The inductor comprises a core having a cylindrical symmetry around the main revolution axis. The core is formed of a soft isotropic magnetic composite material composed of iron and resin. A